

REMARKS

In response to the above Office Action, the specification has been amended to comply with Rule 77 and to provide a brief description of the drawings.

In addition, the claims have been amended as requested to avoid the Examiner's objections to the claims, except for the objections in paragraphs 5(iii) and 11, and to avoid the Examiner's rejections of the claims under 35 U.S.C. § 1112, second paragraph, except for the rejection in paragraph 15.

With respect to the objection to claim 10 set forth in paragraph 5(iii), the condition specified by the Examiner leads to the presence of two "Q" groups and a cyclopentadienyl group associated with the transition metal. Transition metals are of variable valency and the groups appear to be capable of satisfying such valency conditions.

With respect to the objection to claim 15 set forth in paragraph 11, "T" contained within the square brackets represents the oxidation state of the transition metal and is recited so that the correct charge balance for the complex is represented in the formula. Thus, for example, in the case that the transition metal is in the oxidation state of IV and the group "X" is chlorine, $b = 1$ and thus there are $4/1 (= 4)$ chlorine atoms in the complex. In the case that the metal is in the IV oxidation state and the group "X" is sulphate, $b = 2$ and thus there are $4/2 (= 2)$ sulphate groups in the complex.

Finally, with respect to the rejection to claim 9 set forth in paragraph 15, the term "η-5 bonding" is well understood by the man skilled in the art. Essentially compounds capable of η-5 bonding are those having an electronic structure similar to metallocenes (e.g., ferrocene). Thus, the man skilled in the art would have no problem ascertaining from the literature whether a ligand was capable of η-5 bonding.

Withdrawal of the objections to and the rejections of the claims under §112 is therefore requested.

The claims have also been amended to place them in more traditional U.S. format and to use consistent terms of the various elements of the claims. Such amendments are not intended to change the scope of the claims. Claims 2 and 3 were rewritten in independent form because they were in essence drawn to a different process than that of claim 1 from which they depended.

The present invention relates to a method of making long chain zinc alkyls. These alkyls find use commercially either as the compounds per se (e.g., as catalyst modifiers or for other industrial processes) or the alkyls can be converted to the corresponding long chain olefins (oligomers or polymers) or to functionalized derivatives of the alkyls (e.g., long chain alcohols).

The invention differs from conventional transition metal catalyzed polymerization of 1-olefins primarily in that the main product is a zinc alkyl, not a polyolefin. In conventional polymerization of 1-olefins, a transition metal catalyst, e.g., titanium halide, is activated by a relatively small amount of an organometallic compound (especially alkylaluminium compound, but zinc alkyl can sometimes be used instead) to give an active transition metal complex. The activated transition metal complex performs the polymerization normally by forming an unstable intermediate with the 1-olefin, which intermediate can react with more olefin until chain termination occurs (caused by e.g., hydrogen or other chain transfer agent). In these conventional polymerizations there is no stable aluminium complex or zinc complex persisting during the polymerization.

In the present process, the zinc alkyl reacts with 1-olefin more or less in stoichiometric proportions determined by the ratio of zinc to olefin. The product is a zinc alkyl produced by the chain growth. Because the alkyl can undergo chain growth in this manner, the produced alkyl zinc compounds have relatively very narrow molecular weight distribution compared with a polymer prepared by conventional polymerization. The chain growth on the zinc alkyl is promoted by the defined transition metal compound.

In the Office Action the Examiner rejected claims 1, 2, 4-7, and 20 under 35 U.S.C. § 103(a) for being obvious over U.S. Patent No. 5,449,850 to Young et al. (hereafter Young) and claims 1, 2, 4-7, 20, and 21 under 35 U.S.C. § 103(a) for being obvious over WO 91/02707 to Mathys (hereafter Mathys).

These references merely use a zinc alkyl as a catalyst for olefin polymerization. They have nothing to do with or suggest a process for the production of zinc alkyl chain growth products. Note that claim 1 now positively recites that the claimed method produces "a zinc alkyl chain growth product."

The results of the claimed process are amply illustrated by the Examples and the Figures. These show, inter alia, that the molecular weight distributions (MWD) of the products are readily controllable by varying, for example, the zinc:olefin ratio, or the length of time that the olefin is fed to the reaction. In conventional polymerization using catalysts of the type disclosed in Young and Mathys, this ratio has little or no effect on the MWD as the latter is controlled primarily by the characteristics of the active transition metal catalyst.

Reconsideration of the rejections and allowance of claims 1-23 is therefore requested.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

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By: 

Arthur S. Garrett
Reg. No. 20,338

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